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A comparison of clinical characteristics, medications, and outcome between acute stroke and acute myocardial infarction

Ansam F. Sawalha *

Pharmacology and Toxicology, Poison Control and Drug Information Center (PCDIC), An-Najah National University, Nablus, Palestine

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Summary
Objectives: The objective of this study was to compare acute stroke (AS) and acute myocardial infarction (AMI) in terms of clinical characteristics, medications at discharge, and in-hospital outcomes.
Methods: Data were obtained from personal interviews as well as the medical files of the patients admitted to Al-wattani hospital, Palestine in the period September 2006 until August 2007. All data were analyzed using SPSS v15. Chi-square and student's *t* test were used to test for significance.
Results: A total of 281 patients were included, 186 had AS and 95 had AMI. AMI patients were significantly younger than those with AS ($P = 0.000$). Hypertension (HTN) (% 69.9) was the most prevalent risk factor for AS patients, while diabetes mellitus (DM) (46.3%) was the most prevalent risk factor for AMI patients. The prevalence of the following risk factors was significantly different between AS and AMI: HTN ($P = 0.000$), previous stroke ($P = 0.000$), and atrial fibrillation ($P = 0.027$). Antiplatelets ($P = 0.000$), statins ($P = 0.000$), and beta blockers ($P = 0.005$) were prescribed significantly more for patients with AMI than for patients with AS at discharge. However, ACE-I was the only class that was prescribed significantly ($P = 0.000$) more for AS patients compared to AMI. In-hospital mortality among both groups was 20.9% for AS and 16.8% for AMI. There was no significant difference in in-hospital mortality between AS and AMI patients regardless of age. Gender differences in in-hospital mortality between AS and AMI were observed. AS was significantly ($P = 0.010$) more fatal than AMI for males. However, AMI was significantly ($P = 0.048$) more fatal than AS in female patients. Furthermore, males who died after AMI were significantly younger than those who died after AS ($P = 0.001$).

* Tel.: +972 599 675501; fax: +972 9 2345982.
E-mail address: ansam@najah.edu

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Conclusion: AMI affects people at early life phases compared to AS. HTN and DM are among the common risk factors. Prescribing of medications for secondary prevention could be improved. Gender and age differences in outcome are seen in both AS and AMI patients.

Introduction

Cardiac and cerebrovascular diseases are among the top leading causes of mortality world wide [1–4]. In Palestine, heart diseases are the first leading cause of death followed by cerebrovascular diseases [5]. It is currently known that patients with acute stroke (AS) or acute myocardial infarction (AMI) have common risk factors such as age, gender, hypertension (HTN), hypercholesterolemia, and diabetes mellitus (DM) [6–13]. Scientific evidence shows that risk factor modification and life style changes can reduce morbidity and mortality from cardiovascular diseases. For coronary patients, the control of HTN, cholesterol level, DM, and the selective use of prophylactic therapies such as antiplatelets, beta blockers, angiotensin converting enzyme inhibitors (ACE-I), lipid-lowering agents (LLA), and anticoagulants will improve survival [14,15]. No medications are currently available to reverse the effect of a stroke, however, the utilization of antihypertensive medications have been shown to improve outcome [16–18]. Therefore, secondary prevention in patients with pre-existing AS or AMI is important in order to reduce the risk of further events and improve the quality of life in this high risk group.

Much effort has been made to investigate the risk factors, management, and outcomes for AMI and AS patients. However few studies have compared AS to AMI. The aim of this study was to examine the differences in the demographic characteristics, risk factors, secondary preventive treatment options, and outcomes of AS and AMI patients.

Methods

This observational study took place at Al-wattani governmental hospital, Nablus, Palestine. Consecutive patients who were diagnosed with either AS or AMI from September 2006 until August 2007 were included in the study. Patients who were referred for bypass surgery or transferred to another hospital were excluded. The diagnosis of AS was confirmed by computerized tomography (CT) scans, while the diagnosis of AMI was confirmed by electrocardiograms (ECG) and enzyme levels. Patients were followed up until either discharged alive or death in-hospital. Data collection, approved by hospital officials, was based on both medical records and personal interviews with the patients. The following data were obtained: age, gender, diagnosis, risk factors, and medications at discharge. Risk factors considered in this study included: HTN, DM, congestive heart failure (CHF), atrial fibrillation (AF), ischemic heart disease (IHD), and history of a previous stroke. The medications of interest were antiplatelets, statins, ACE-I, beta blockers, and calcium channel blockers since all were found effective in secondary prevention [14] Data regarding in-hospital mortality were also analyzed. The end point of interest was the number of patients discharged alive from hospital after AS or AMI. All data were stored electronically, and statistically analyzed using SPSS (statistical package for social science) version 15. Categorical variables were expressed as percentage and frequency, while continuous variables were expressed as mean ± standard deviation, Pearson Chi-square and independent student's t test were used to test for statistical associations between variables. P value <0.05 was used as the level of significance.

Results

During the study period, a total of 281 patients met the inclusion criteria. Among those patients, 186 had AS and the remaining 95 patients had AMI. CT scans of AS patients revealed that 153 had an ischemic stroke (82.3%), and the remaining 33 had hemorrhagic stroke (17.7%). The mean age of the stroke patients was 69.09 ± 10.9 and the mean age of the AMI patients was 60.4 ± 11.3 years. The difference in age between AS and AMI patients was significant (P = 0.000).

Age and gender analysis showed that 157 of all the patients were males and 124 were females. There was a significant difference (P = 0.00) in gender distribution of AMI patients, with the majority being males (66 males vs. 29 females). However, there was no significant difference (P = 0.65) in gender distribution of AS patients. The age of the male and female patients was analyzed. For males, there was a significant difference between the mean age of AS and AMI patients (69.4 vs. 57.3, respectively; $P = 0.00$). However, there was no significant difference in the age of female patients in the AS and AMI groups (68.7 vs. 67.8, respectively; $P = 0.56$) (Table 1).

The risk factors for both AS and AMI were investigated. It was noted that HTN was the most prevalent (69.9%) risk factor among AS patients, while DM was the most prevalent (46.3%) risk factor for AMI patients. It is noteworthy that a similar percentage (45.2%) of AS patients also had DM which makes it a common risk factor for both diseases. HTN ($P = 0.000$), previous stroke ($P = 0.000$), and atrial fibrillation ($P = 0.027$) were significantly associated with an acute stroke (Table 2).

Medications prescribed at discharge were analyzed. Antiplatelets were prescribed for all AMI patients and for 85.2% of the patients with AS, the difference being statistically significant ($P = 0.00$). Furthermore, there was a significant difference in the prescription of statins (81.4%, $P = 0.000$) and beta blockers (20.3%, $P = 0.005$) at discharge for patients with AMI as compared to AS. On the other hand, ACE-I were prescribed significantly (52.8%, $P = 0.000$) more for AS patients than AMI patients. There were significant differences in the prescription of all medications among the two patient categories except for the calcium channel blockers (Table 3).

Analysis of in-hospital mortality revealed that 39 (20.9%) of AS patients and 16 (16.8%) of AMI patients died during their hospital stay. There were 32 (20.4%) deaths among all the male patients and 23 (18.5%) deaths among all the female patients. There was no significant difference between the mean ages of the deceased AS and AMI patients of either gender. There was, however, a statistically significant difference in the age of the male patients who died after AMI compared to AS patients (70.7 years for AS vs. 57.4 years for AMI; $P = 0.01$) (Table 4).

Further analysis showed that in-hospital mortality was gender-dependent but not age-dependent. As seen in Table 5, there was no significant difference between AS and AMI patients in in-hospital mortality for all patients >65 years ($P = 0.613$), or all those <65 years ($P = 0.834$). More male patients older than 65 years died after AS than after AMI (29.0% vs. 5.3%, respectively; $P = 0.032$). Different results were found for females of the same age group, with more female deaths after AMI than AS (33.3% vs. 16.9%, respectively; $P = 0.127$). When analyzing the results, it was obvious that for all male patients, AS was the leading cause of death (27.5% for AS vs. 10.6% for AMI; $P = 0.010$), while for females, AMI was the leading cause of in-hospital mortality (31.0% for AMI vs. 14.7% for AS; $P = 0.48$) (Table 5). Males were more likely to die after AS than AMI regardless of age (OR 1.48), while females were less likely (OR 0.76).

Discussion

In this study, the clinical characteristics, medications at discharge and in-hospital outcome of AMI

Table 1 Age distribution of males and females with AS and AMI.

Males vs. females	Gender						Group
	Females			Males			
	Age mean + SD	Age range	N	Age mean + SD	Age range	N	
$P = 0.65$	68.7 ± 11.1	41–89	95	69.4 ± 10.7	47–90	91	AS
$P = 0.00$	67.8 ± 8.7	41–80	29	57.3 ± 11.0	32–82	66	AMI
	$P = 0.56$			$P = 0.000$			AS vs. AMI
	68.5 ± 10.6	41–89	124	66.1 ± 11.8	32–90	157	AS + AMI

Table 2 Risk factors for AS and AMI patients.

Risk factor	Percent of patients with a risk factor and		OR (95% CI)	P
	Acute stroke ($n = 186$)	Acute MI ($n = 95$)		
Hypertension	130 (69.9%)	32 (33.7%)	1.71 (1.39–2.09)	0.000
Diabetes mellitus	84 (45.2%)	44 (46.3%)	0.98 (0.82–1.17)	0.85
Recurrent MI	14 (7.5%)	13 (13.7%)	0.77 (0.53–1.11)	0.098
Recurrent stroke	74 (39.8%)	10 (10.5%)	1.55 (1.34–1.79)	0.000
Heart failure	23 (12.4%)	9 (9.5%)	1.09 (0.87–1.39)	0.47
Atrial fibrillation	26 (13.9%)	5 (5.3%)	1.31 (1.09–1.57)	0.027

Table 3 Medications prescribed at discharge.

Medications	Percent of Patients at discharge who had medications and had		v^2 (*P* value)
	Acute stroke	Acute MI	
Antiplatelets	121 (85.2%)	49 (100%)	0.000
Statins	23 (16.2%)	48 (81.4%)	0.000
ACE-I	75 (52.8%)	13 (22%)	0.000
Beta blockers	9 (6.3%)	12 (20.3%)	0.005
CCB	26 (16.9%)	10 (18.3%)	0.496

Table 4 Age and gender of patients who died with acute stroke or acute MI.

Males vs. females	Gender						Group
	Females			Males			
	Mean + SD	Range	*N*	Mean + SD	Range	*N*	
P = 0.572	71.7 ± 11.7	46–85	14	70.7 ± 11.3	54–90	25	AS
P = 0.174	68.7 ± 6.9	58–75	9	57.4 ± 11.5	50–82	7	AMI
	P = 0.49			*P* = 0.01			AS vs. AMI
	70.5 ± 10.1	46–85	23	67.8 ± 12.5	50–90	32	AS + AMI

Table 5 In-hospital death rates by gender and age in acute stroke and acute MI.

Group (age in years)	No. of patients with the event/no. of patients in the given group (%) who had		OR (95% CI)	*P*
	AS	AMI		
Males				
⩽65	7/29 (24.1%)	6/47 (12.8%)	1.54 (0.84–2.83)	0.201
>65	18/62 (29.0%)	1/19 (5.3%)	1.34 (1.10–1.62)	0.032
Females				
⩽65	3/30 (10.0%)	3/11 (27.3%)	0.65 (0.29–1.47)	0.166
>65	11/ 65 (16.9%)	6/18 (33.3%)	0.79 (0.55–1.14)	0.127
All males	25/91 (27.5%)	7/66 (10.6%)	1.48 (1.16–1.98)	0.010
All females	14/95 (14.7%)	9/29 (31.0%)	0.76 (0.54–1.07)	0.048
All (>65)	29 (17.7%)	7 (4.3%)	0.79 (0.31–1.98)	0.613
All (⩽65)	10 (8.5%)	9 (7.7%)	0.90 (0.34–2.41)	0.834

and AS patients were investigated and compared. Patients with AMI were younger than those with AS, which is in agreement with data reported in the literature [18]. A previous study found that coronary risk appears to be particularly high in Palestinian Arabs with the total coronary event rates and non-fatal MI rates exceeding those in Finland, Scotland, and Northern Ireland [19–20]. Most studies of AMI and AS have reported a male preponderance [18,21,22]. In this study, the unexpectedly equal male:female ratio among AS patients might be attributed to a high percentage of women above 45 years. Such women have a higher risk for stroke than men. Lifestyle could be another factor since it was found that 52% of Arab women in Israel were obese, exhibited lifestyle factors that generally increased the risk of coronary heart disease, and were exposed to more passive smoking compared to Jewish women [23–25]. In our study, height and weight were not consistently reported in the medical files, thus calculations of body mass index were not possible.

Despite the availability of guidelines and evidence-based therapies for the optimal management of AMI patients, less than optimal management at discharge was observed in this study. Similar findings were reported in several studies conducted elsewhere [14,18,26–28].

Our study shows that the rate of death was higher for AS patients compared to AMI patients, which is in agreement with a previously published study [18]. In-hospital mortality was both gender- and age-dependent. For male patients, risk of in-hospital mortality was higher in AS patients than in AMI patients. On the other hand, risk of in-hospital mortality in female patients was higher after AMI than after AS. The outcome for AS patients was similar to that observed in other Arab countries [29–31]. No comparable regional data on in-hospital mortality were found, however, a study by Kuch et al. [32] showed a lower mortality rate. In the US, approximately 80% of deaths due to CHD occur in persons $\geqslant$65 years of age [33]. Previous studies have shown that elderly patients with AMI are treated less vigorously than younger patients [34]. Additionally, elderly patients tend to have more co-morbid diseases and are consequently at higher risk of death. Gender-related differences in survival have also been observed, notably in studies by Wolinsky et al. [35], and by Hanratty et al. [36]. Some researchers suggest that the higher post MI mortality in females compared to males may be partially due to treatment differences between males and females. The authors concluded that the failure to treat females as vigorously as males had contributed significantly to their worse outcome [34]. At discharge, statins were prescribed at a significantly higher rate for males compared to females among the total sample and among stroke patients. Females in the AMI group were also prescribed fewer statins than males, yet, the difference was not significant. Other researchers have noted similar findings, adding that risk factors for AMI are more likely to be controlled in males than females [37]. Gender differences in the receipt of recommended therapy after AMI is happening in many countries including the US [38].

Recommendations

Better screening and control of risk factors are highly needed. Additionally, evidence-based medical practice is needed to reduce mortality after AS and AMI. Up-to-date management protocols should be implemented for patient care and there needs to be continuous evaluation of modifiable risk factors and the effectiveness of medication use for secondary prevention. Current gaps between recommendations and practice suggest that new efforts should be undertaken to better educate care providers in hospitals regarding current treatment protocols to improve the quality of care for patients with AS and AMI.

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